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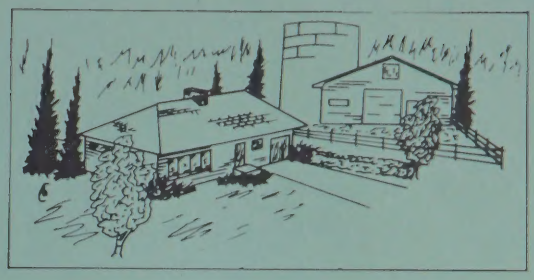

Building in Alaska

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SPECIAL CONSIDERATIONS FOR BUILDING IN ALASKA

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The following special considerations for building in Alaska are recommended which are normally not included in structures designed for the milder climates of the lower-49 states. Plans and publications will be developed as new construction techniques are developed in Arctic construction.

A. FOUNDATIONS

1. Consult with an architect, engineer or contractor before building on soils subject to permafrost which includes most of Interior Alaska.

2. Enclosed crawl spaces or basements should not be constructed in soils subject to permafrost. Wood piles, mud sills or freeze tubes with open crawl spaces are suggested in permafrost soil.

3. In areas where masonry or concrete foundations are used, they must be reinforced against seismic action in accordance with local or state codes. Masonry chimneys should also be reinforced against earthquake.

4. Consult with local insurance agent and borough engineer before building in areas subject to flooding.

5. Install adjustable louvres in the foundation wall of unheated crawl spaces that may be opened for summer ventilation to minimize formation of excess condensation and rotting of wood framing members.

6. Foundations should be closed in and the building heated to avoid excessive heaving and settlement of footers during winter.

7. All masonry and concrete foundations should be properly reinforced to minimize cracking due to heaving and settling of frozen ground.

B. FLOORS

1. In permafrost areas floors should be constructed over open crawl spaces and insulated to minimize melting of the permafrost and to avoid uneven settlement of the building.

2. The surface temperature of the floor is of particular concern in Arctic climates as this is where we work, play and relax during our waking hours. The closer the floor surface temperature approaches room ambient temperature, the greater the comfort level.

3. A cold floor results in discomfort of direct radiation, stratification of cold air near the floor and warm air near the ceiling.

4. Floors should be insulated as described in section on "INSULATION."

5. A polyethylene vapor barrier should be installed directly under the rough flooring of a floor placed over an unheated or open crawl space. Floors with deep trussed joists or lumber plywood "I-Beam" joists should be vapor proofed and insulated with a foamed-in-place urethane insulation applied to the bottom covering of the cavity.

6. An uninsulated concrete slab on-grade floor is not recommended for the main living area as ground temperatures in Alaska are near 33°F. If used as the living area, the entire floor should be insulated with at least one inch of rigid foam plastic insulation. Perimeter type insulation is not adequate for Alaska.

7. A polyethylene vapor barrier should be placed under all concrete floor poured on grade or laid on the ground of closed crawl spaces to minimize the migration and evaporation of excessive moisture from the soil.

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C. WALLS

1. Walls should be insulated as described in section on "INSULATION."

2. A polyethylene vapor barrier should be placed on the interior faces of the studs directly over the insulation (warm side). Be careful to seal all openings that must be made to accomodate plumbing vent stacks, chimneys, electrical wiring, etc.

3. The vapor barrier should be installed on the ceiling first before any interior partitions are installed. Place the wall vapor barrier on the inside (warm) side of ceiling lap.

4. Wherever possible, it is recommended that no electrical wiring be installed in the ceiling except as outlined in section on "ELECTRICAL WIRING."

5. Radiation and cold drafts caused by cold wall surfaces can be corrected by baseboard radiation or hot air registers placed along the perimeter of exposed walls.

D. CEILING

1. The ceiling should be insulated as described in section on "INSULATION."

2. To minimize condensation stains on the ceiling and glaciering at the eaves and valleys, the roof cavity must be kept cool and free of moisture by a combination of adequate vapor barrier, insulation and ventilation.

3. A polyethylene vapor barrier should be placed on interior surfaces of the ceiling directly under the insulation, prior to the erection of partitions. Leave 8 to 12 inches overhang on the walls.

4. Be careful to seal all openings through the vapor barrier that may be caused by the installation of plumbing, electrical outlets, chimneys, etc.

5. The roof cavity must be ventilated by a combination of 1/2 inch continuous slots at both eaves and louvres at the gable.

6. If the supporting beam of a flat roof must be reset into the ceiling, then a cricket must be constructed in the roof deck over the beam to assure adequate eave-to-eave ventilation.

7. Framing of scuttle openings or stairways into uninsulated attics should be avoided as it will eventually lead to condensation and frosting problems.

8. Openings into a cold attic, if absolutely essential, should be provided through the gable wall.

9. If an attic must be accessible from the interior of the house for storage purposes, then it should be adequately insulated, vapor proofed, ventilated and heated to avoid condensation and frosting problems.

10. The use of thicker insulation (6 to 10 inches or more) for the ceiling necessitates special precautions to assure adequate insulation at the eaves of gable roofs.

11. The trusses may be cantilevered so that they extend over the wall 18 to 24 inches on both sides allowing 12 to 18 inches between the roof deck and the plate which should provide 9 to 12 inches clear space over the top of the plate.

12. Lumber sizes of conventional rafters may be increased to provide sufficient ventilation space over the insulation at the eaves. Also the rafters may be raised up on a special header notched into the ceiling joists instead of setting the rafter onto the wall plate.

13. Do not taper the insulation at the eaves or pull the insulation back from the wall plate as this increases the heat conduction through the plate, joists, and rafters. Condensation and staining of interior finished surfaces may occur adjacent to the header and under the ceiling framing members.

14. Wherever possible it is recommended that the installation of concealed wiring be avoided in ceilings of cold roof cavities. Refer to section on "ELECTRICAL WIRING" for alternative suggestions.

E. INSULATION

The following minimum insulation values are recommended for Alaskan homes:

	FLOOR		WALL	CEILING
	Closed Crawl Space unheated	Open Crawl Space		
R-Value[1] (1/U)	11.0	33.0	11.0	19.0
U-Value[2] (BTU/Hr/SF/°F)	0.0737	0.0298	0.091	0.052
Interior Surface[3] Temperature, °F	67.0	67.0	64.3	66.8
Fiberglass[4] k=.27, inches	3.5	9.5	3.5	6.0
Polystyrene[5] k=.24, inches	2.6	7.9	2.6	4.6
Urethane[5] surface coat k=.17, inches	1.9	5.6	1.9	3.2
impervious skin k=.15, inches	1.6	5.0	1.6	2.9

1/ Minimum recommended R-value of the insulation alone.

2/ U-values include normal exterior and interior finished to determine interior surface temperature.

3/ Based on temperature of 70°F inside and -40°F outside and 35°F for the closed unheated crawl space. If higher floor surface temperature is desired then floor cavity must be heated.

4/ Normal rated thicknesses for fiberglass insulation.

5/ The k-values of foam plastic insulation varies with the density of material as applied.

F. VAPOR BARRIER

1. A 4-6 mil polyethylene vapor barrier shall be installed over all interior surfaces directly over the insulation prior to installation of partitions and interior finishes.

2. Refer to sections on "FLOORS, WALLS, AND CEILING" for further details. Also refer to section on "INSPECTION."

G. INSPECTION

1. It is recommended that no interior finished floor, wall and roof covering be installed until the insulation, vapor barrier, concealed plumbing, and electrical wiring has been approved by the prospective homeowner or his authorized representative consisting of either the building inspector, the finance agency and/or the architect.

2. If the building must be enclosed prior to inspection of the vapor barrier, then the contractor should be asked to extend the warranty or to provide sufficient funds in escrow with a bank to correct any damage due to negligent workmanship or faulty material for a period of two years after final inspection. Such an agreement should be drawn up by your personal lawyer before any contract is signed with the contractor, real estate agent, and/or the finance agent.

H. VENTILATION

1. Ventilation fans should be provided in the kitchen, bathroom and laundry room. Do not vent fans directly into the roof or crawl space cavities.

2. If electricity is not available, a simple exhaust duct installed over the cook stove and vented through the roof to the outdoors. The air flow may be controlled by an adjustable damper.

3. Automatic clothes driers, whether electric or gas heated, should be vented outdoors by an approved vent pipe.

4. An air intake should be installed from the outside into all furnace rooms. The air intake should be fitted with dampers that will close by gravity while the oil burner or stoker blower is not operating.

I. WINDOWS

1. Windows for Alaskan homes should be constructed with wood frames and sash and fitted with double sealed glass. Single glass may be glazed into the sash and fitted on the outside of the sash with a second removable glass pane.

2. Storm type windows fitted onto the window frames are not suitable for prolonged periods of subzero temperatures as migration of moisture around weather-stripping condenses out onto the storm window and will obscure the glass with heavy frost. Once the frost has formed, it cannot be removed except by warming the storm windows by special insulated storm shutters.

3. To eliminate condensation problems along the edge (rim) of double insulating glass panes, a third pane of glass may be installed over the outside of the wood sash.

4. Discomfort of drafts and radiation to windows can be nullified by properly designed baseboard radiation and hot air registers placed along the perimeter of exposed walls.

J. DOORS

1. Storm doors and closed entries are desirable for arctic climates.

2. Metal doors with an insulated core and special thermal separators between the inside and the outside shells are excellent for arctic conditions, except adjustable door frames are necessary to compensate for the continual heaving and settling of the active frost layer of the soils of the interior of Alaska.

K. STORAGES

1. The placement of closets, kitchen cabinets, and other built-in storages on exterior walls should be avoided wherever possible to minimize condensation and frosting problems. This includes storages placed under the eaves of 1-1/2 story houses.

2. If storage space must be placed along exterior walls, provide adequate ventilation by means of louvred doors, drapes or other openings. A section of baseboard radiation placed on exterior walls would be a positive aid in maintaining the closet above the dew-point temperature.

3. Avoid storing boxes, books, magazines and clothing tightly against exterior walls. Install 1" X 1" on 2" centers, wood slats on the wall and floor to facilitate natural ventilation.

L. ELECTRICAL WIRING

1. In order to avoid condensation problems caused by the inadvertant puncturing of the polyethylene vapor barrier by present concealed wiring techniques, it is suggested that either the wiring be run in exposed raceways or concealed in special chases as outlined below.

2. Exposed Wiring. Electrical circuits and outlets may be run with exposed "Wiremold" raceways with surface outlets or "Electrostrip" narrow feed-in cable with adjustable conveniences outlets. These circuits may be fed from wiring and outlets concealed in adjacent interior partitions.

3. Concealed Wiring. a) The wiring may be laid in chases constructed from 2" X 3" nailers that are installed perpendicular to the studs or rafters after the insulation and vapor barrier has been properly placed and sealed.

L. ELECTRICAL WIRING (cont'd)

b) Where circuits must pass through obstructions such as at the sole or plate, the nailers should be cut out and the cable protected from possible shorting of nails with 1" X 1" X 1/8" angle iron caps.

c) The added cost of the nailer may be partially offset by elimination of the need to bore holes and thread the cables through the framing members.

d) The short construction season of Arctic climates necessitates enclosing the building as soon as possible and installing temporary heat without having all of the concealed plumbing and wiring built into the wall before the insulation and vapor barrier can be properly installed and inspected. Refer to sections on "VAPOR BARRIER," "INSPECTION," and "UNVENTED SPACE HEATERS."

e) A 6-mil vapor should be used when nailers are provided as electrical chases.

M. UNVENTED SPACE HEATERS

1. Do not operate unvented fuel oil or bottled gas space heaters as temporary heat until the insulation and vapor barrier has been fully installed and adequately sealed.

2. If the vapor barrier is not sealed, the invisible water vapor produced by the space heater will condense out in the insulation and other cold surfaces.

3. The moisture may freeze and damage the siding.

4. During the spring thaw, melting of the ice will stain exterior and interior finishes.

N. CHIMNEY

1. The chimney must be tightly sealed at the ceiling to minimize migration of moisture and infiltration of excess heat into the roof cavity.

2. Gas furnaces should be provided with an approved masonry chimney or all-fuel pre-fabricated metal chimney.

3. Light weight uninsulated metal gas vents can result in excess heat formation in a poorly vented roof cavitiy, particularly a gable roof, which can result in excessive glaciering at the eaves.

O. HEATING

1. The packaged precut or panel home should include a complete set of plans and a tabulation of the heat losses of each room, the recommended size heating plant, the size of baseboard radiation, size of hot water heating pipes, electric heating conductors, sizes of hot air and return registers, size of ducts, and an estimate of annual fuel or energy requirements for Alaskan climates.

2. All hot water heating plans should provide for approved zone control valves and balancing cocks for each heating zone.

3. All hot air heating plans should provide for adjustable dampers on each branch duct and adjustable blower pulleys for proper balancing of the air flow to each register.

4. If the prime contractor or subcontractor do not maintain service personnel in Alaska during the winter season, then the local heating contractor should be designated to correct any normal deficiencies in the heating system, such as excess noise, improper balancing, excessive fuel consumption, etc.

P. SEPTIC TANK

1. The septic tank and seepage pit or drain field should be placed near the driveway for convenience in cleaning. The location should be accurately dimensioned on the plot plan and permanently marked on the ground with concrete monuments.

2. A 4-inch wood stove clean-out should be extended to the grade to facilitate cleaning without having to search and dig for the septic tank and seepage pit during subzero temperatures. The opening should be adequately sealed against infiltration of cold air.

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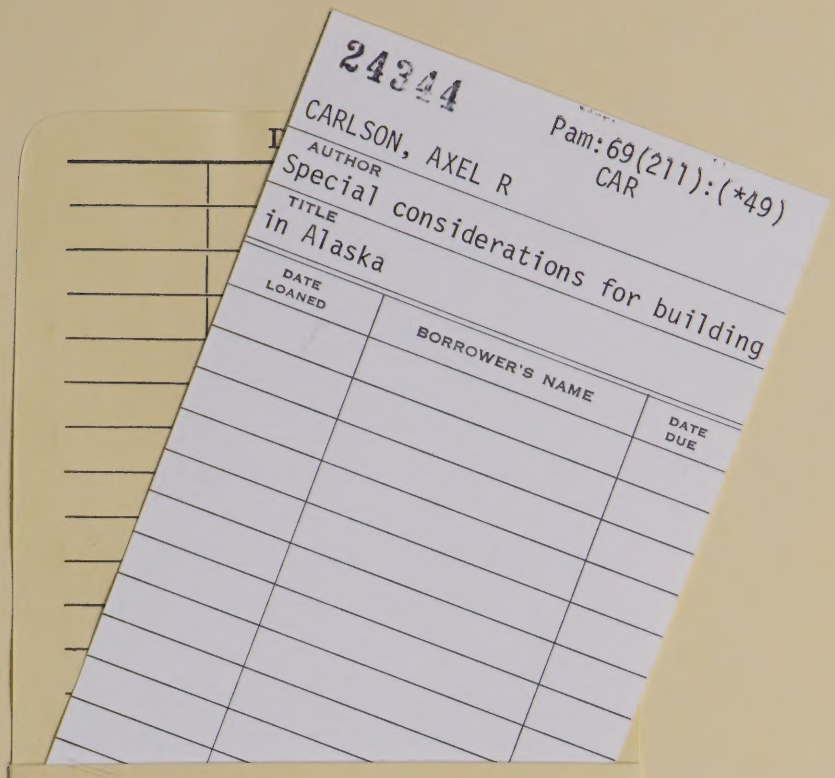

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